

(I-frame) followed by a plurality of pairs of predictively encoded frames (PB-frame pairs), each PB-frame pair having a corresponding P-block:

5 dividing each I-frame or PB-frame pair into a plurality of spatially non-overlapping blocks of pixel data:

encoding the blocks from the I-frame (I-blocks) independently from any other frames in the group of pictures:

10 predictively encoding the blocks from the second frame of the PB-frame pair (P-blocks), based on the I-blocks in the previous I-frame or the P-blocks in the previous PB-frame pair:

15 bi-directionally predictively encoding the blocks from the first frame of the PB-frame pair (B-blocks), based on the I-blocks in the previous I-frame or the P-blocks in the previous PB-frame pair and the corresponding P-block in the current PB-frame pair:

20 deriving a scaled forward motion vector and a scaled backward motion vector for the B-block by scaling the motion vector of the corresponding P-block in the current PB-frame pair:

obtaining a final forward motion vector for the B-block by adding a delta motion vector to the scaled forward motion vector; and

25 obtaining a final backward motion vector for the B-block by subtracting the delta motion vector from the scaled backward motion vector.

2. A method for encoding a sequence of video image frames according to claim 1, wherein

30 the scaling of the motion vector is based on a temporal reference of the first and second frames of the PB-frame pair.

3. A method for encoding a sequence of video image frames according to claim 1, further comprising the step of forming an encoded output, wherein the encoded output is a bitstream comprising:

temporal reference information for the first and second frames of the PB-frame pairs:

40 motion vector information for the P-blocks:

quantized residual error information for the P-blocks:

delta motion vector information for the B-blocks; and

quantized residual error information for the B-blocks.

4. A method for encoding a sequence of video image frames according to claim 3, wherein

the output bitstream contains additional information to indicate the presence of at least one of:

the delta motion vector information for the B-blocks; and

50 the quantized residual error information for the B-blocks.

5. A method for decoding a sequence of video image frames comprising the steps of:

decoding the compressed video image sequence as a set of group of pictures, each group of pictures comprising an

55 I-frame followed by a plurality of PB-frame pairs, each PB-frame pair having a corresponding P-block:

decoding each I-frame or PB-frame pair into a plurality of spatially non-overlapping blocks of pixel data:

60 decoding the I-blocks from the I-frame independently from any other frames in the group of pictures:

predictively decoding the P-blocks from the second frame of the PB-frame pair based on the I-blocks in the previous I-frame or the P-blocks in the previous PB-frame pair:

65 bi-directionally predictively decoding the B-blocks from the first frame of the PB-frame pair based on the

00691855-101300

deriving a scaled forward motion vector and a scaled backward motion vector for the B-block by scaling the motion vector of the corresponding P-block in the current PB-frame pair:

obtaining a final backward motion vector for the B-block by subtracting the delta motion vector from the scaled backward motion vector.

temporal reference information for the first and second frames of the PB-frame pairs: 20

quantized residual error information for the P-blocks;  
the delta motion vector information for the B-blocks; and  
quantized residual error information for the B-blocks.

the bitstream contains additional information to indicate the presence of at least one of:

the delta motion vector information for the B-blocks; and  
the quantized residual error information for the B-blocks.

the scaling is based on a temporal reference of the first and second frames of the PB-frame pair. 35

9. An apparatus for encoding a sequence of video image frames comprising:

means for encoding each frame in a sequence of video image frames into a set of group of pictures, each group of pictures comprising an I-frame followed by a plurality of PB-frame pairs:

means for dividing the I-frame and the PB-frame pair into a plurality of spatially non-overlapping blocks of pixel data;

means for encoding and decoding the I-blocks of the I-frame independently from any other frames in the group of pictures:

means for storing the decoded I-blocks to predictively encode subsequent frames:

means for predictively encoding and decoding the P-blocks of the second frame of the PB-frame pair based on the I-blocks in the previous I-frame or the P-blocks in the previous PB-frame pair:

means for storing the decoded P-blocks to predictively  
encode subsequent frames:

means for deriving a scaled forward motion vector and a scaled backward motion vector for a B-block by scaling the motion vector of the corresponding P-block in the current PB-frame pair, the B-block being the first frame of the PB-frame pair:

means for obtaining a final forward motion vector for the B-block by adding a delta motion vector to the scaled forward motion vector:

means for obtaining a final backward motion vector for the B-block by subtracting the same delta motion vector from the scaled backward motion vector; and

means for encoding the B-blocks of the first frame of the PB-frame pairs based on the I-blocks in the previous I-frame or the P-blocks in the previous PB-frame pair and the corresponding P-block in the current PB-frame pair using the final forward motion vector and the final backward motion vector.

10. An apparatus for decoding a sequence of video image frames comprising:

means for decoding each frame in a sequence of video image frames into a set of group of pictures, each group of pictures comprising an I-frame followed by a plurality of PB-frame pairs:

means for decoding the I-blocks of the I-frame independently of any other frames in the group of pictures:

means for storing the decoded I-blocks to predictively decode subsequent frames:

means for decoding the P-blocks of the second frame of the PB-frame pair based on the I-blocks in the previous I-frame or the P-blocks in the previous PB-frame pair:

means for storing the decoded P-blocks to predictively decode subsequent frames:

means for deriving a scaled forward motion vector and a scaled backward motion vector for a B-block by scaling the motion vector of the corresponding P-block in the current PB-frame pair, the B-block being the first frame of the PB-frame pair:

means for obtaining a final forward motion vector for the B-block by adding a delta motion vector to the scaled forward motion vector;

means for obtaining a final backward motion vector for the B-block by subtracting the delta motion vector to the scaled backward motion vector; and

means for decoding the B-blocks of the first frame of the PB-frame pairs based on the I-blocks in the previous I-frame of the P-blocks in the previous PB-frame pair and the corresponding P-block in the current PB-frame pair using the final forward motion vector and the final backward motion vector.

11. A method for encoding a sequence of video image frames comprising the steps of:

dividing a source sequence into a plurality of groups of pictures, each group of pictures comprising a first frame (I-frame) followed by a plurality of pairs of predictively encoded frames (PB-frame pairs):

dividing each I-frame or PB-frame pair into a plurality of blocks:

encoding the blocks from the I-frame:

predictively encoding the blocks from the second frame of the PB-frame pair:

bi-directionally predictively encoding the blocks from the first frame of a PB-frame pair (B-blocks):

deriving a scaled forward motion vector and a scaled backward motion vector for the B-block:

obtaining a final forward motion vector for the B-block by adding a delta motion vector to the scaled forward motion vector; and

obtaining a final backward motion vector for the B-block by subtracting the delta motion vector from the scaled backward motion vector.

12. An apparatus for encoding a sequence of video image frames comprising:

means for dividing a source sequence into a plurality of groups of pictures, each group of pictures comprising a

00691858-101800

first frame (I-frame) followed by a plurality of pairs of predictively encoded frames (PB-frame pairs);

means for dividing each I-frame or PB-frame pair into a plurality of blocks;

means for encoding the blocks from the I-frame;

means for predictively encoding the blocks from the second frame of the PB-frame pair;

means for bi-directionally predictively encoding the blocks from the first frame of a PB-frame pair (B-blocks);

008707" 85876960

means for deriving a scaled forward motion vector and a scaled backward motion vector for the B-block;

means for obtaining a final forward motion vector for the B-block by adding a delta motion vector to the scaled forward motion vector; and

means for obtaining a final backward motion vector for the B-block by subtracting the delta motion vector from the scaled backward motion vector. 7

008707-85816960

1                   13. A method for decoding a  
2                   compressed video image sequence of a  
3                   group of pictures including an I-frame  
4                   followed by a plurality of P-frames and B-  
5                   frames, comprising the steps of:

6                   decoding a block in the I-  
7                   frame independently from any other frames  
8                   in the group of pictures;

9                   predictively decoding a block  
10                  in a P-frame based on the previous I-frame  
11                  or a previous P-frame;

12                  bi-directionally predictively  
13                  decoding a block in a B-frame based on the  
14                  previous I-frame or a previous P-frame and  
15                  a block in a P-frame positioned after the B-  
16                  frame;

17                  deriving a scaled forward  
18                  motion vector and a scaled backward motion  
19                  vector for the block in the B-frame by  
20                  scaling a motion vector of the block in the  
21                  P-frame positioned after the B-frame;

22                  obtaining a final forward  
23                  motion vector for the block in the B-frame  
24                  by adding a delta motion vector to the scaled  
25                  forward motion vector; and



- 14                   the delta motion vector  
15           information for the block in the B-frame;  
16           and
- 17                   quantized residual error  
18           information for the block in the B-frame.
- 1                   16. A method for decoding a  
2           sequence of video image frames according  
3           to claim 15, wherein
- 4                   the bitstream contains  
5           additional information indicating a presence  
6           of at least one of
- 7                   the delta motion vector  
8           information for the block in the B-frame;  
9           and
- 10                   the quantized residual error  
11           information for the block in the B-frame.